State of Hawaii

Department of Health
Clean Air Branch
Honolulu, Hawaii

Annual Summary
Hawaii Air Quality Data

2000

2000
HAWAII AIR QUALITY DATA

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Section 1
INTRODUCTION

The Department of Health has been monitoring ambient air quality in the State of Hawaii since 1957. Until 1971, there was only one air monitoring site, which was located on the island of Oahu. The air monitoring network today has expanded to include 17 monitoring stations on Oahu, Kauai, Maui and Hawaii. The primary purpose of the statewide monitoring network is to measure ambient air concentrations of the six criteria pollutants that the United States Environmental Protection Agency (EPA) has promulgated National Ambient Air Quality Standards (NAAQS). The six criteria pollutants with NAAQS are: carbon monoxide, nitrogen dioxide, sulfur dioxide, lead, ozone and particulate matter less than or equal to 10 micrometers (PM_{10}). The State of Hawaii also has standards for ozone, carbon monoxide and nitrogen dioxide more stringent than the NAAQS and an ambient air standard for hydrogen sulfide.

Ambient air monitoring for lead was discontinued in October 1997 with EPA approval. Since sampling for lead began, levels in the state have been far below the federal standard, and with the elimination of lead in gasoline, measured levels were consistently zero or nearly zero.

Most commercial, industrial and transportation activities and their associated air quality effects occur on Oahu where nine of the stations are located. Agricultural operations produce the greatest air quality impacts on Maui and Kauai. Impacts on ambient air quality from the ongoing eruption of the Kilauea Volcano and from activities associated with geothermal energy production are being monitored on the island of Hawaii. Current plans call for the continuation of sampling at these sites, however, relocations, additions and/or discontinuations can occur in the future as the need arises.

This report summarizes the air pollutant data collected at the 17 monitoring stations during calendar year 2000. Tabular and graphic summaries are provided which compare the measured concentrations with State and Federal ambient air quality standards. In addition, air pollutant concentration trend summaries are depicted in graphic form.

Various other data may be summarized as the need arises. Questions regarding these data and other air quality data should be addressed to:

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Section 2
DEFINITIONS

"Ambient Air": The general outdoor atmosphere, external to buildings, to which the general public has access.

"Ambient Air Quality": The quality or state of purity of the ambient air.

"Ambient Air Quality Standard": A limit in the quantity and exposure to pollutants dispersed or suspended in the ambient air.

"Carbon Monoxide": Carbon monoxide (CO) is a colorless, odorless, tasteless gas under atmospheric conditions. It is produced by the incomplete combustion of carbon fuels with the majority of emissions coming from transportation sources.

"Collocated": Procedure required for a certain percentage of PM_{10} samplers in the monitoring network. Collocated samplers determine precision or variation in the PM_{10} concentration measurements of identical samplers run in the same location under the same sampling conditions.

"EPA": The United States Environmental Protection Agency.

"Hydrogen Sulfide": Hydrogen sulfide (H_2S) is a toxic, colorless gas with a characteristic "rotten egg" odor detectable at very low levels. Also known as sewer gas, it is naturally occurring from sources such as volcanic activity, petroleum exploration and bacterial decomposition of organic matter.

"NAAQS": National Ambient Air Quality Standards. These are pollutant standards that the EPA has established to protect public health and welfare. NAAQS have been set for carbon monoxide, nitrogen dioxide, PM_{10}, ozone, sulfur dioxide, and lead. These are commonly referred to as the six criteria pollutants.

"NAMS": National Air Monitoring Stations. Sites which are part of the SLAMS network, must meet more stringent siting requirements, equipment type and quality assurance criteria.

"Nitrogen Dioxide": Nitrogen dioxide (NO_2) is a brownish, highly corrosive gas with a pungent odor. It is formed in the atmosphere from emissions of nitrogen oxides (NO_x). Sources of nitrogen oxides include electric utilities, industrial boilers, motor vehicle exhaust and combustion of fossil fuels. NO_2 is also a component in the atmospheric reaction that produces ground-level ozone.

"Ozone": This is the main constituent in photochemical air pollution. It is formed in the atmosphere by a chemical reaction of nitrogen oxides (NO_x) and volatile organic compounds (VOCs) in the presence of sunlight. In the upper atmosphere, ozone (O_3) shields the earth from harmful ultraviolet radiation; however, at ground level, it can cause harmful effects in humans and plants.

"Particulate Matter": Any dispersed matter, solid or liquid, in which the individual aggregates are larger than the single molecules in diameter, but smaller than 500 microns. Particulate matter includes dust, soot, smoke, and liquid droplets from sources such as factories, power plants, motor vehicles, construction activities, agricultural activities, and fires.

"PM_{10}": Particulate matter that is 10 microns or less in aerodynamic diameter. The EPA revised the NAAQS for particulate matter in 1987 to cover only PM_{10} because the smaller particles have a greater potential for respiratory health impacts.

"SLAMS" State and Local Air Monitoring Stations. The Clean Air Act requires that every state establish a network of air monitoring stations for criteria pollutants, using requirements set by the EPA Office of Air Quality Planning and Standards.

"Sulfur Oxides": Sulfur oxides are colorless gases which include sulfur dioxide (SO_2), sulfur trioxide, their acids and the salts of their acids. Emissions of sulfur oxides are largely from sources that burn fossil fuels such as coal and oil. In the State of Hawaii, another source of sulfur oxide emissions is from the eruption of Kilauea Volcano on the Big Island.

"Vog": Vog is a local term used when referring to the atmospheric haze produced by the combination of volcanic gas and particles with air and sunlight.

Table 2-1 **State of Hawaii and Federal Ambient Air Quality Standards**

Air Pollutant	Averaging Time	Standards		
		Hawaii State Standard [a] ($\mu g/m^3$)	Federal Primary Standard [b] ($\mu g/m^3$)	Federal Secondary Standard [c] ($\mu g/m^3$)
Carbon Monoxide	1-hour 8-hour	10,000 5,000	40,000 10,000	40,000 10,000
Nitrogen Dioxide	Annual (arithmetic)	70	100	100
PM_{10}	24-hour Annual (arithmetic)	150 50	150 50	150 50
Ozone	1-hour	100	235	235
Sulfur Dioxide	3-hour 24-hour Annual (arithmetic)	1,300 365 80	--- 365 80	1,300 --- ---
Lead	Calendar Quarter (arithmetic)	1.5	1.5	1.5
Hydrogen Sulfide	1-hour	35	—	---

[a] Designated to protect public health and welfare and to prevent the significant deterioration of air quality. Source: HAR §11-59-1
[b] Designated to prevent against adverse effects on public health. Source: 40CFR Part 50
[c] Designated to prevent against adverse effects on public welfare, including effects on comfort, visibility, vegetation, animals, aesthetic values, and soiling and deterioration of materials. Source: 40CFR Part 50

Section 3
SITE LOCATIONS AND DESCRIPTIONS

This section provides a description of the monitoring stations in the State of Hawaii. Table 3-1 lists the air pollutant(s) measured at each monitoring station, characterizes the area surrounding the station, and indicates the start dates for data collection. Table 3-2 identifies the type of sampler used to measure the concentration of each air pollutant. Figures 3-1, 3-2, 3-3 and 3-4 show the location of each monitoring station on the islands of Oahu, Kauai, Maui and Hawaii, respectively.

The following three subsections discuss each monitoring station in more detail.

A. ISLAND OF OAHU

1. Honolulu: Located atop the Department of Health (DOH) building (Kinau Hale), at 1250 Punchbowl Street in downtown Honolulu, this site is in a commercial, institutional, and residential area. It was established in April 1971 as a NAMS and SLAMS station. The pollutants sampled at this site are PM_{10}, CO, and $SO_{2.}$

2. Pearl City: Located atop the Leeward Medical Center, at 860 Fourth Street, the area is a combination of commercial and residential units and is approximately nine and a half miles northwest of downtown Honolulu. This site was established in April 1971 as a NAMS site initially for collection of Total Suspended Particulates (TSP) before it was changed to PM_{10} sampling in July 1985.

3. Waimanalo: Located within the Waimanalo Sewage Treatment Facility, at 41-1069 Kalanianaole Highway, this site is in a sparsely populated rural and agricultural community. Waimanalo is on the windward (upwind) side of Oahu approximately ten miles east-northeast of downtown Honolulu. This site was established in June 1971 as a SLAMS site initially for the sampling of TSP before it was changed to PM_{10} sampling in July 1989.

4. Sand Island: Located at the Anuenue Fisheries, the area is composed of light industrial, commercial, recreational, and harbor units and is approximately two miles southwest (typically downwind) of downtown Honolulu. This is a NAMS station that was established in February 1981 for the sampling of ozone.

5. Waikiki: Located at 2131 Kalakaua Avenue, Waikiki is a busy commercial and residential area with heavy vehicular traffic. It is approximately three miles southeast of downtown Honolulu. The station was established in January 1981as a NAMS site for the sampling of carbon monoxide.

6. Liliha: Located at Kauluwela Elementary School, 1486 Aala Street, this site is in a residential and commercial area near the H-1 freeway, approximately one and a quarter miles north of downtown Honolulu. This NAMS station was established in January 1984 and currently monitors for PM_{10}.

7. Makaiwa: Located at 92-670 Farrington Highway, this site is in a residential and agricultural area approximately twenty-five miles west of downtown Honolulu. This station is downwind and to the southeast of an electrical power plant. This site was established in July 1989 as a SLAMS station monitoring for SO_2.

8. West Beach: Located within the Ko'Olina Golf Course, this site is in a recreational, residential, and agricultural area approximately 27 miles west of downtown Honolulu and 1.5 miles northwest of Campbell Industrial Park. This SLAMS station was established in February 1991 for NO_2, PM_{10}, CO and SO_2.

9. Kapolei: Located at 91-591 Kalaeloa Boulevard at the entrance to Campbell Industrial Park, this site is in a commercial, industrial, and residential area with nearby agricultural lands. It is approximately 25 miles west of downtown Honolulu and was established in February 1991 as a SLAMS site. Air pollutants measured at the site include NO_2, PM_{10}, CO and SO_2.

B. ISLAND OF KAUAI

Lihue: The Lihue monitoring station is located in downtown Lihue at the District Health Office, 3034 Umi Street. This site is in a commercial and residential area with nearby agricultural areas. It is a SLAMS station that was established in November 1972 for the sampling of total particulates but was changed to a PM_{10} sampling site in October 1985.

C. ISLAND OF MAUI

1. Kihei: This station is located in Hale Piilani Park. This special purpose monitoring station is in a residential and agricultural area and was established to monitor PM_{10} from sugarcane burning activities.

2. Paia: This station is located in a residential area at 141 Baldwin Avenue. The site is downwind of several sugarcane fields and is just northeast of the HC&S Co. Paia Mill. This site was established in August 1996 as a special PM_{10} sampling station for sugarcane burning activities.

D. ISLAND OF HAWAII

1. Kona: This station is located on the grounds of the Konawaena High School at 81-1043 Konawaena School Road in Kealakekua, Hawaii. This special purpose site was established in April 1997 to monitor vog in the Kona area. The pollutants sampled at this site are SO_2 and PM_{10}. The 1-in 6-day sampling for PM_{10} at this site was discontinued on June 11, 2000.

2. Hilo: Established in March 1995, this station is located on the grounds of the Adult Rehabilitation Center of Hilo at 1099 Waianuenue Avenue to monitor vog. The pollutants sampled are SO_2 and PM_{10}.

3. Honokaa: Located at Honokaa High and Intermediate School at 45-527 Pakalana Street, this station was established in August 1997 on the upwind side of the island to monitor vog. The pollutants sampled at this site are SO_2 and PM_{10}. This site was discontinued on August 1, 2000.

4. Lava Tree: This station in Puna, is located on the eastern border of the Lava Tree State Park in a residential-agricultural area near Nanawale Estates. It is approximately 1.4 miles northwest of the Puna Geothermal Venture power plant. The station was established in August 1993 and monitors for H_2S.

5. Puna E: Located in the Leilani Estates residential subdivision in Puna, it is approximately 3 miles south-southwest of the Puna Geothermal Venture power plant. Established in 1992, this station monitors for H_2S.

Table 3-1 **State of Hawaii Air Monitoring Network**

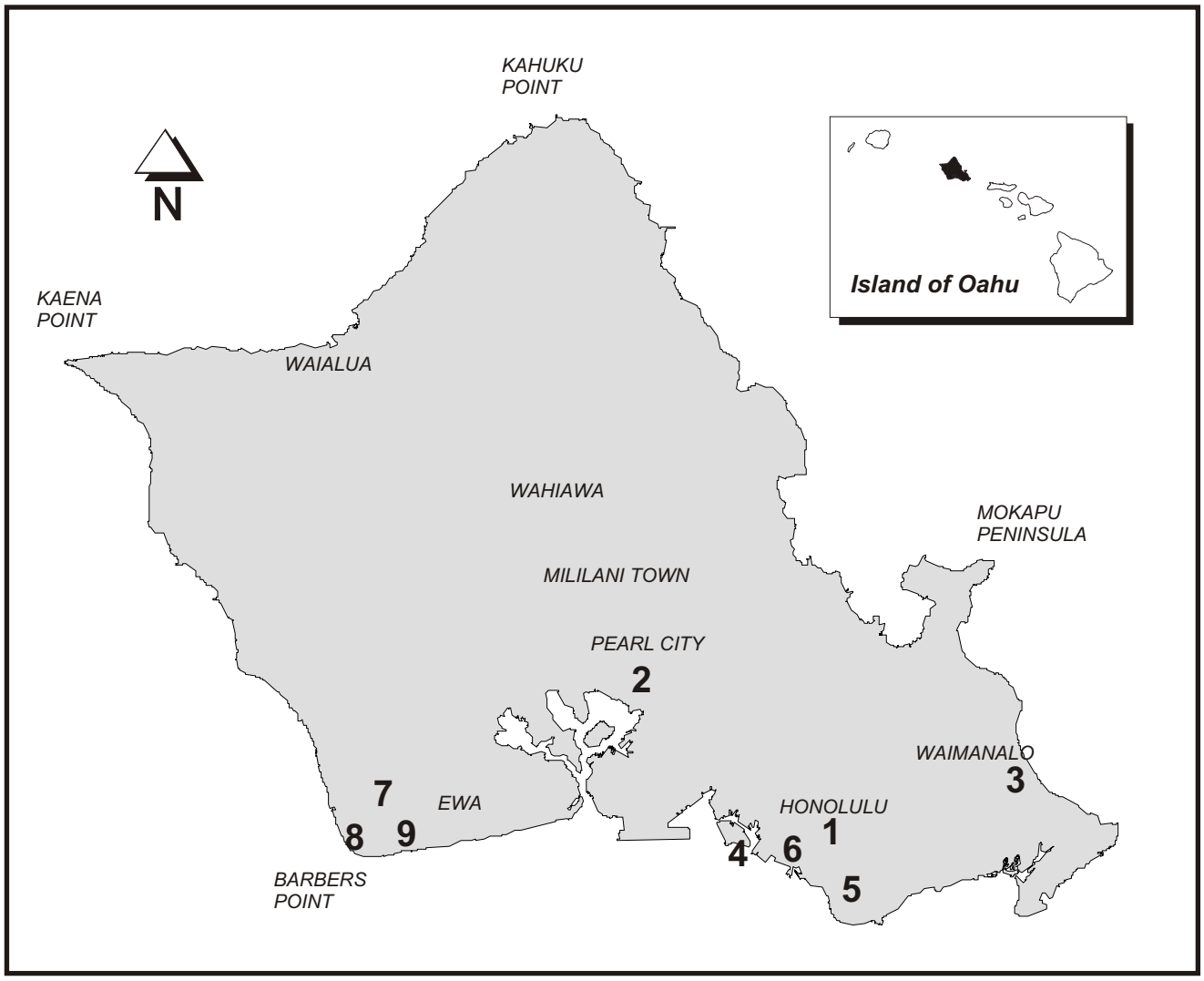
SITE	Station Type						SITE DESCRIPTION	START DATE
	PM_{10}	CO	O_3	SO_2	NO_2	H_2S		
OAHU								
HONOLULU	N	N	-	S	-	-	Center City/Commercial	April 1971
PEARL CITY	N	-	-	-	-	-	Suburban/Residential	April 1971
WAIMANALO	S	-	-	-	-	-	Rural / Agricultural	July 1989
SAND ISLAND	-	-	N	-	-	-	Center City	January 1981
WAIKIKI	-	N	-	-	-	-	Center City	February 1981
LILIHA	N	-	-	-	-	-	Center City	January 1981
MAKAIWA	-	-	-	S	-	-	Rural / Industrial	July 1989
WEST BEACH	S,C	S	-	S	S	-	Rural/Industrial	February 1991
KAPOLEI	S	S	-	S	S	-	Rural / Industrial	February 1991
KAUAI								
LIHUE	S	-	-	-	-	-	Center City / Commercial	October 1985
MAUI								
KIHEI	SS	-	-	-	-	-	Suburban / Residential	June 1996
PAIA	SS	-	-	-	-	-	Rural / Residential	August 1996
HAWAII								
KONA	SS	-	-	SS	-	-	Suburban	April 1997
HILO	SS	-	-	SS	-	-	Center City	March 1995
HONOKAA	SS	-	-	SS	-	-	Rural/Agricultural	May 1997
LAVA TREE	-	-	-	-	-	SS	Rural/Agricultural	August 1993
PUNA E	-	-	-	-	-	SS	Rural/Agricultural	1992

N = (NAMS) National Air Monitoring Station
C = Collocated Site
S = (SLAMS) State and Local Air Monitoring Stations
SS = Special Study (for sugar cane burning, vog, and geothermal energy)

Table 3-2 **Sampling Equipment at Each Monitoring Station**

Monitoring Station							
	PM_{10} Continuous Ambient Particulate Monitor	PM_{10} Manual Ambient Particulate Monitor (1 in 6 day)	CO Continuous Non-dispersive Infrared Analyzer	SO_2 Continuous Pulsed Fluorescent Ambient Air Analyzer	O_3 Continuous UV Photometric Analyzer	NO_2 Continuous Chemiluminescence Analyzer	H_2S Continuous Pulsed Fluorescent Ambient Air Analyzer
OAHU							
Honolulu	X		X	X			
Pearl City	X						
Waimanalo		X					
Sand Island					X		
Waikiki			X				
Liliha	X						
Makaiwa				X			
West Beach		X	X	X		X	
Kapolei	X		X	X		X	
KAUAI							
Lihue		X					
MAUI							
Kihei	X						
Paia	X						
HAWAII							
Kona		X		X			
Hilo		X		X			
Honokaa		X		X			
Lava Tree							X
Puna E							X

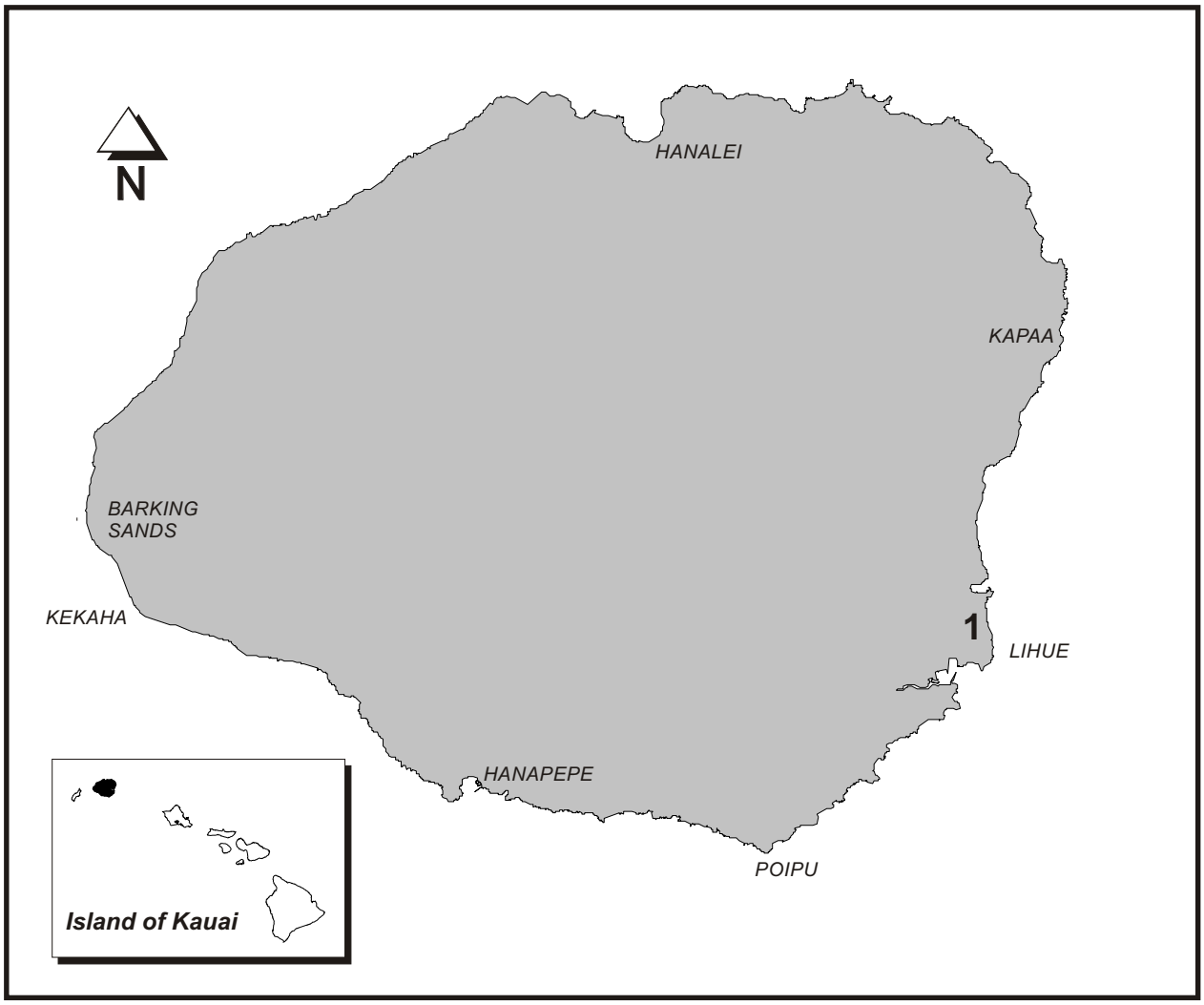
Figure 3-1 **Island of Oahu: Location of Air Monitoring Stations**



LEGEND

1 Honolulu (PM_{10}, SO_2, CO)
2 Pearl City (PM_{10})
3 Waimanalo (PM_{10})
4 Sand Island (O_3)
5 Waikiki (CO)
6 Liliha (PM_{10})
7 Makaiwa (SO_2)
8 West Beach (PM_{10}, SO_2, CO, NO_2)
9 Kapolei (PM_{10}, SO_2, CO, NO_2)

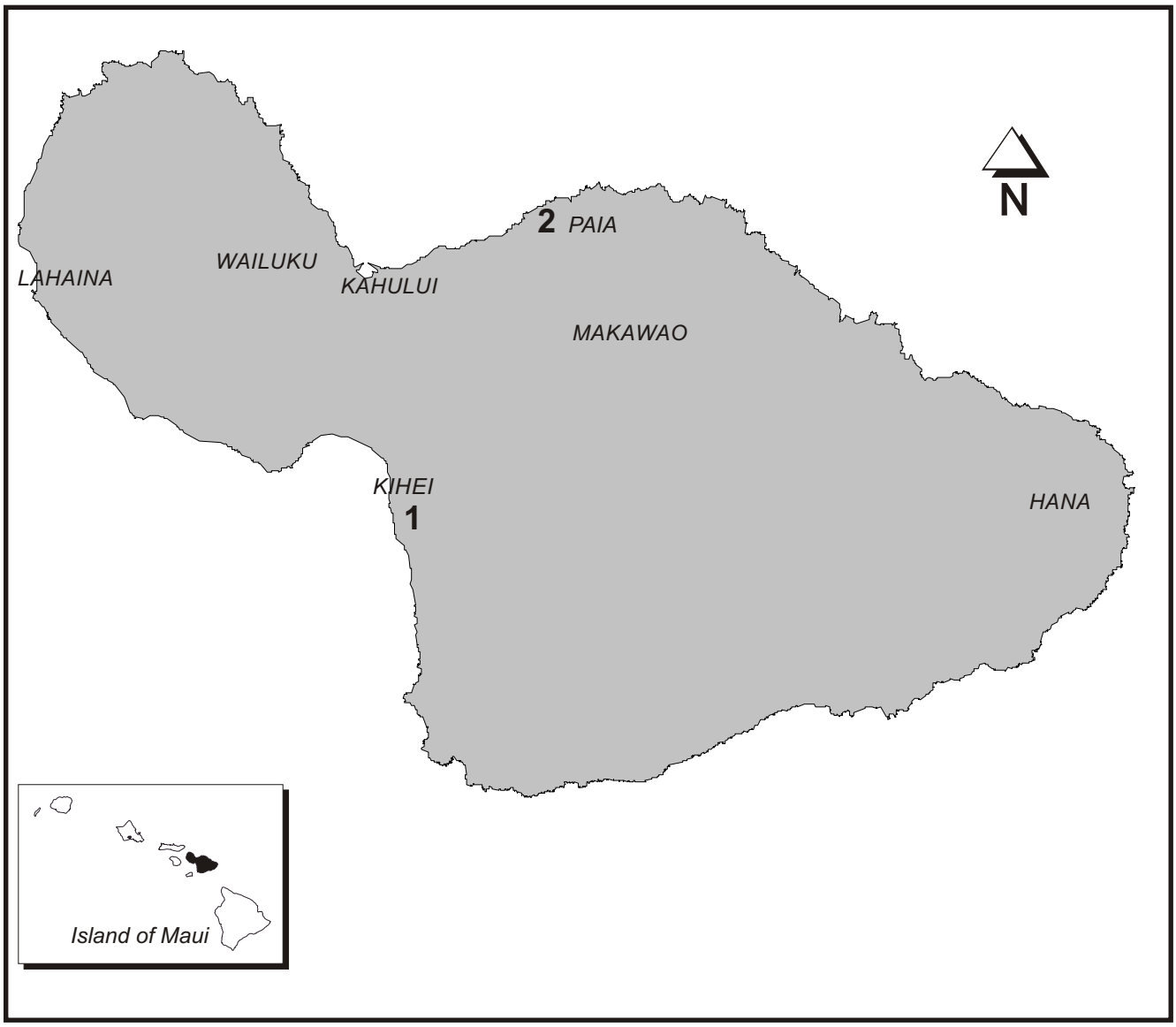
Figure 3-2 **Island of Kauai: Location of Air Monitoring Station**



LEGEND

1 Lihue (PM_{10})

Figure 3-3 **Island of Maui: Location of Air Monitoring Stations**

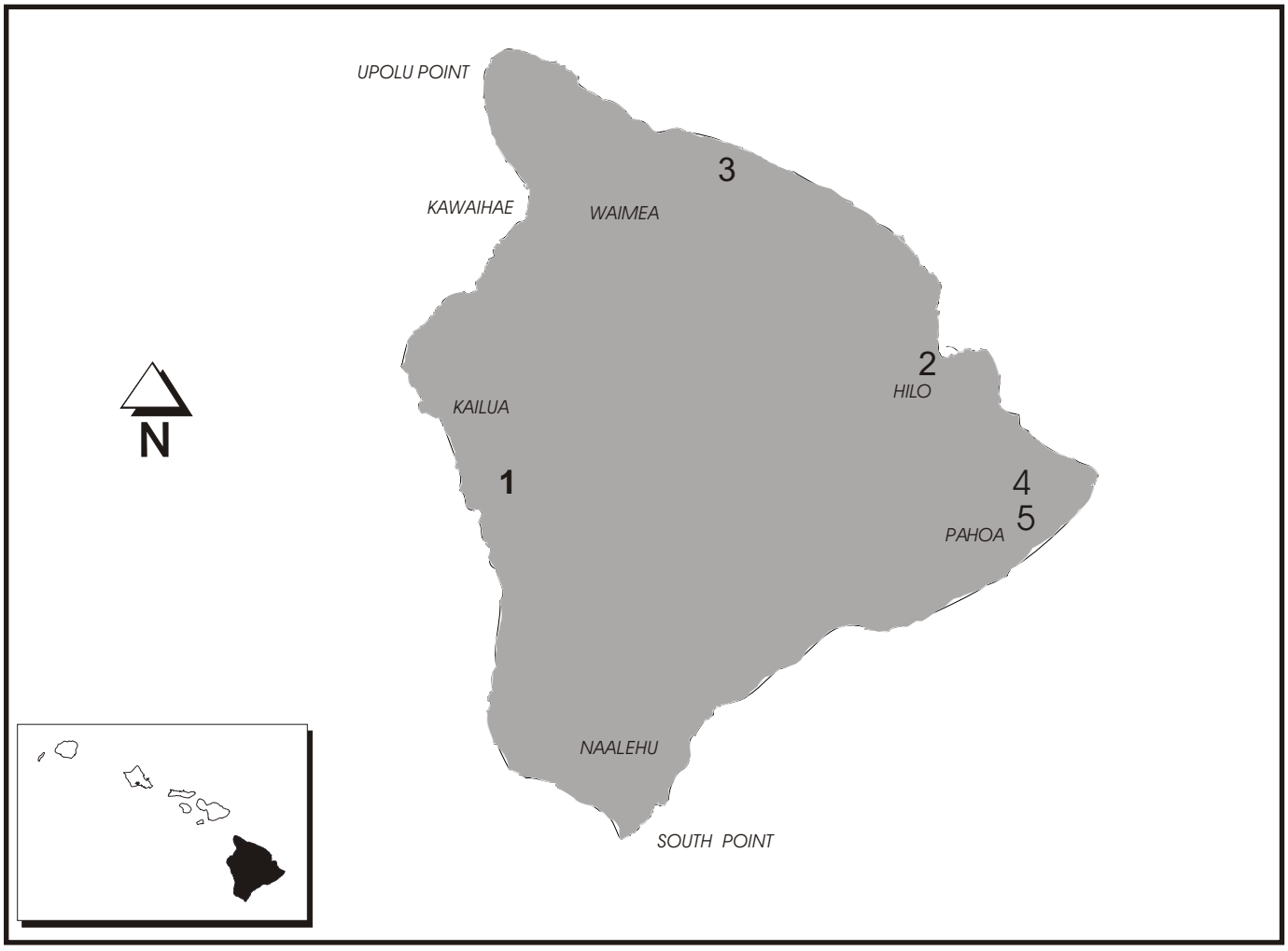


LEGEND

1 Kihei (PM_{10})

2 Paia (PM_{10})

Figure 3-4 **Island of Hawaii: Location of Air Monitoring Stations**



LEGEND

1 Kona (PM_{10}, SO_2)
2 Hilo (PM_{10}, SO_2)
3 Honokaa (PM_{10}, SO_2)
4 Lava Tree (H_2S)
5 Puna E (H_2S)

Section 4
2000 AIR QUALITY DATA

Hawaii enjoys some of the best air quality in the nation and, being an island state, is not impacted by pollution from neighboring states. However, as in any metropolitan area, there is some air pollution from various industrial and mobile sources in addition to agricultural and natural sources. The Department of Health, Clean Air Branch, has the responsibility for monitoring, protecting and enhancing the state's air quality and regulates and monitors pollution sources to ensure that the levels of criteria pollutants remain well below the state and federal air quality standards.

The following tables summarize the pollutant concentrations measured at each monitoring station. Tables 4-1 through 4-7 are annual summaries grouped by pollutant and provide the number of occurrences exceeding the NAAQS. There is no federal ambient air quality standard for H_2S, and Table 4-8 provides the number of occurrences exceeding the state standard.

The annual statistics provided in tables 4-1 through 4-8 are the highest and second highest $\mu g/m^3$ values recorded in the year for the averaging period and the annual means, which is the arithmetic mean of all valid hours recorded in the year. The possible periods is the total number of possible sampling periods in the year for the averaging time, and valid periods is the total number of sampling periods after data validation.

Tables 4-9 through 4-16 are monthly summaries of the range and average of each pollutant for each averaging period. The range is the lowest and highest $\mu g/m^3$ values recorded in the month for the averaging period and the average is the arithmetic mean of all hours recorded in the month. The highest value recorded in the year for each site is highlighted.

In the year 2000, the State of Hawaii was in attainment for all federal ambient air quality standards.

Table 4-1 **Annual Summary of 24-Hour PM_{10}**

	Annual Statistics			24-hour Occurrences Greater than 150 µg/m³													
	Max Hr		Annual Means														
	1st High	2nd High	All Hours	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Possible Periods	Valid Periods
OAHU																	
Honolulu	83	31	14	0	0	0	0	0	0	0	0	0	0	0	0	366	361
Liliha	65	44	15	0	0	0	0	0	0	0	0	0	0	0	0	366	363
Waikiki	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sand Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
[a]Waimanalo	35	28	17	0	0	0	0	0	0	0	0	0	0	0	0	61	47
Pearl City	164[b]	154[b]	16	1[b]	0	0	0	0	0	0	0	0	0	0	1[b]	366	358
Makaiwa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kapolei	148	129	17	0	0	0	0	0	0	0	0	0	0	0	0	366	356
[a]West Beach	41	40	14	0	0	0	0	0	0	0	0	0	0	0	0	61	54
KAUAI																	
[a]Lihue	39	36	18	0	0	0	0	0	0	0	0	0	0	0	0	61	50
MAUI																	
Kihei	83	77	25	0	0	0	0	0	0	0	0	0	0	0	0	366	355
Paia	48	45	18	0	0	0	0	0	0	0	0	0	0	0	0	366	350
HAWAII																	
[a]Kona	23	23	18	0	0	0	0	0	0	0	0	0	0	0	0	28[c]	17
[a]Hilo	18	16	11	0	0	0	0	0	0	0	0	0	0	0	0	61	41
[a]Honokaa	23	17	10	0	0	0	0	0	0	0	0	0	0	0	0	36[d]	22
Lava Tree	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Puna E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

[a] PM_{10} sampling once every 6th day [b] Highest values, measured by a continuous method, occurred on 1/1/00 and 12/31/00, probably due to fireworks
[c] PM_{10} sampling was discontinued at this site on 6/11/00 [d] This station was discontinued on 8/1/00

Table 4-2 **Annual Summary of 1-Hour Carbon Monoxide**

	Annual Statistics			1-hour Occurrences Greater than 40,000 µg/m³													
	— Max Hr —		--Annual Means--														
	1st High	2nd High	All Hours	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Possible Periods	Valid Periods
OAHU																	
Honolulu	3990	3762	774	0	0	0	0	0	0	0	0	0	0	0	0	8784	8726
Liliha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Waikiki	4332	4332	905	0	0	0	0	0	0	0	0	0	0	0	0	8784	8728
Sand Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Waimanalo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pearl City	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Makaiwa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kapolei	2508	1596	336	0	0	0	0	0	0	0	0	0	0	0	0	8784	8595
West Beach	1596	1596	197	0	0	0	0	0	0	0	0	0	0	0	0	8784	8368
KAUAI																	
Lihue	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAUI																	
Kihei	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Paia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HAWAII																	
Kona	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hilo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Honokaa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lava Tree	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Puna E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 4-3 **Annual Summary of 8-Hour Carbon Monoxide**

	Annual Statistics			8-hour Occurrences Greater than 10,000 µg/m³													
	— Max Hr—		--Annual Means--														
	1st High	2nd High	All Hours	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Possible Periods	Valid Periods
OAHU																	
Honolulu	1753	1724	774	0	0	0	0	0	0	0	0	0	0	0	0	1098	1091
Liliha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Waikiki	2166	2038	905	0	0	0	0	0	0	0	0	0	0	0	0	1098	1094
Sand Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Waimanalo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pearl City	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Makaiwa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kapolei	1055	827	336	0	0	0	0	0	0	0	0	0	0	0	0	1098	1076
West Beach	1012	627	197	0	0	0	0	0	0	0	0	0	0	0	0	1098	1042
KAUAI																	
Lihue	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAUI																	
Kihei	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Paia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HAWAII																	
Kona	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hilo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Honokaa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lava Tree	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Puna E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 4-4 **Annual Summary of 1-Hour Ozone**

	Annual Statistics			1-hour Occurrences Greater than 235 µg/m³													
	— Max Hr—		--Annual Means--														
	1st High	2nd High	All Hours	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Possible Periods	Valid Periods
OAHU																	
Honolulu	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Liliha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Waikiki	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sand Island	98	96	32	0	0	0	0	0	0	0	0	0	0	0	0	8784	8482
Waimanalo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pearl City	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Makaiwa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kapolei	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
West Beach	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KAUAI																	
Lihue	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAUI																	
Kihei	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Paia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HAWAII																	
Kona	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hilo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Honokaa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lava Tree	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Puna E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 4-5 **Annual Summary of 3-Hour Sulfur Dioxide**

	Annual Statistics			3-hour Occurrences Greater than 1,300 µg/m³													
	— Max Hr—		--Annual Means--														
	1st High	2nd High	All Hours	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Possible Periods	Valid Periods
OAHU																	
Honolulu	65	18	1	0	0	0	0	0	0	0	0	0	0	0	0	2928	2832
Liliha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Waikiki	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sand Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Waimanalo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pearl City	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Makaiwa	72	69	3	0	0	0	0	0	0	0	0	0	0	0	0	2928	2862
Kapolei	23	18	1	0	0	0	0	0	0	0	0	0	0	0	0	2928	2505
West Beach	11	9	1	0	0	0	0	0	0	0	0	0	0	0	0	2928	2304
KAUAI																	
Lihue	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAUI																	
Kihei	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Paia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HAWAII																	
Kona	50	49	6	0	0	0	0	0	0	0	0	0	0	0	0	2928	2897
Hilo	438	301	4	0	0	0	0	0	0	0	0	0	0	0	0	2928	2277
Honokaa	213	176	4	0	0	0	0	0	0	0	0	0	0	0	0	1704[a]	1691
Lava Tree	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Puna E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

[a] This station was discontinued on 8/1/00

Table 4-6 **Annual Summary of 24-Hour Sulfur Dioxide**

	Annual Statistics			24-hour Occurrences Greater than 365 µg/m³													
	— Max Hr—		--Annual Means--														
	1st High	2nd High	All Hours	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Possible Periods	Valid Periods
OAHU																	
Honolulu	9	7	1	0	0	0	0	0	0	0	0	0	0	0	0	366	357
Liliha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Waikiki	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sand Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Waimanalo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pearl City	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Makaiwa	20	17	3	0	0	0	0	0	0	0	0	0	0	0	0	366	361
Kapolei	6	5	1	0	0	0	0	0	0	0	0	0	0	0	0	366	362
West Beach	4	4	1	0	0	0	0	0	0	0	0	0	0	0	0	366	333
KAUAI																	
Lihue	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAUI																	
Kihei	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Paia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HAWAII																	
Kona	25	16	6	0	0	0	0	0	0	0	0	0	0	0	0	366	365
Hilo	94	73	4	0	0	0	0	0	0	0	0	0	0	0	0	366	284
Honokaa	61	28	4	0	0	0	0	0	0	0	0	0	0	0	0	213[a]	213
Lava Tree	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Puna E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

[a] This station was discontinued on 8/1/00

Table 4-7 **Annual Summary of Nitrogen Dioxide**

	Annual Statistics			Annual Occurrences Greater than 100 µg/m³													
	— Max Hr —		-Annual Means-														
	1st High	2nd High	All Hours	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Possible Periods	Valid Periods
OAHU																	
Honolulu	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Liliha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Waikiki	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sand Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Waimanalo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pearl City	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Makaiwa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kapolei	-	-	9	-	-	-	-	-	-	-	-	-	-	-	0	8784	7213
West Beach	-	-	7	-	-	-	-	-	-	-	-	-	-	-	0	8784	8104
KAUAI																	
Lihue	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAUI																	
Kihei	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Paia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HAWAII																	
Kona	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hilo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Honokaa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lava Tree	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Puna E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 4-8 **Annual Summary of 1-Hour Hydrogen Sulfide**

	----------Annual Statistics----------			----------1-hour Occurrences Greater than 35 µg/m^3----------														
	— Max Hr---		-Annual Means-															
	1st High	2nd High	All Hours	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Possible Periods	Valid Periods
OAHU																		
Honolulu	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Liliha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Waikiki	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sand Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Waimanalo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pearl City	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Makaiwa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kapolei	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
West Beach	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KAUAI																		
Lihue	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAUI																		
Kihei	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Paia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HAWAII																		
Kona	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hilo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Honokaa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lava Tree	7	7	2	0	0	0	0	0	0	0	0	0	0	0	0	8784	8319
Puna E	13	7	<1	0	0	0	0	0	0	0	0	0	0	0	0	8784	8276

Table 4-9 **Monthly Summary of 24-Hour PM_{10} ($\mu g/m^3$)**

Station		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Honolulu	Range	7-***83***	9-21	7-31	8-21	8-21	7-15	10-17	9-21	7-18	12-22	9-23	8-20
	Average	15	15	16	15	14	11	13	15	13	16	15	14
Liliha	Range	10-***65***	9-21	13-36	9-25	9-22	8-16	10-18	9-19	7-18	9-21	10-20	8-44
	Average	16	16	19	16	15	11	14	14	12	15	15	14
Pearl City	Range	8-***164***	9-24	8-33	8-21	9-21	7-17	10-19	10-20	8-18	13-24	13-26	11-154
	Average	19	16	17	15	14	12	14	15	13	16	19	15
Waimanalo [a]	Range	10	20	6-15	16-***35***	12-20	11-15	17-22	14-25	9-18	12-28	7-22	8-18
	Average	10	20	10	23	16	14	18	17	14	22	16	13
Kapolei	Range	8-***148***	7-38	9-41	7-129	9-35	8-27	10-30	8-19	8-16	8-52	8-26	7-22
	Average	19	19	17	28	18	16	14	13	12	16	14	14
West Beach [a]	Range	3-19	7-16	10-32	13-19	10-***41***	10-40	8-12	8-11	7-12	8-17	8	5-13
	Average	11	14	17	15	23	18	10	10	9	14	8	9
Lihue [a]	Range	11-21	27-36	13-***39***	16-21	12-24	13-18	15-20	16-29	13-21	14-27	12-22	8-22
	Average	14	32	20	18	20	15	17	24	17	21	16	15
Kihei	Range	9-48	14-67	10-41	10-77	15-64	13-54	16-62	10-46	14-52	13-77	5-37	9-***83***
	Average	17	25	20	23	28	26	35	29	27	30	17	18
Paia	Range	7-***48***	9-30	10-42	10-23	10-28	11-45	12-26	13-32	12-30	12-21	12-23	10-33
	Average	15	19	22	16	16	16	17	18	19	16	16	19
Kona [a]	Range	No Data	13-21	16-17	16-22	17-***23***	14-15	PM_{10} Sampling discontinued at this site on 6/16/00					
	Average		18	16	19	20	14						
Hilo [a]	Range	7-13	10-16	8-12	No Data	No Data	10-10	10-15	9-14	6-11	7-16	8	6-***18***
	Average	10	13	11			10	13	11	8	12	8	10
Honokaa [a]	Range	4-11	8-***23***	12-12	No Data	9-11	7-11	4-10	Station discontinued on 8/01/00				
	Average	7	15	12		10	10	8					

[a] Sampling is once every 6th day

Table 4-10 **Monthly Summary of 1-Hour Carbon Monoxide (µg/m^3)**

Station		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Honolulu	Range	342-***3990***	456-3192	456-2508	456-1368	342-2052	114-2166	342-2052	456-1824	342-2508	228-2052	456-3762	342-2964
	Average	755	925	870	706	710	746	696	793	813	549	907	832
Waikiki	Range	342-***4332***	456-4332	342-2964	228-1938	456-2280	114-2166	114-1710	456-2166	456-2850	570-2508	0-3078	0-2964
	Average	963	1193	1175	679	907	1065	603	790	1003	978	718	788
Kapolei	Range	0-1368	0-1596	0-912	0-798	0-1596	0-1140	0-***2508***	228-912	0-1140	0-1140	0-1482	114-1596
	Average	285	287	283	219	353	216	490	404	345	327	320	495
West Beach	Range	0-798	0-1254	0-798	0-570	0-1140	0-456	0-1026	114-456	0-570	0-684	0-***1596***	0-912
	Average	133	230	267	181	274	235	164	146	103	218	228	189

Table 4-11 **Monthly Summary of 8-Hour Carbon Monoxide (µg/m^3)**

Station		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Honolulu	Range	371-1582	641-1525	599-1268	485-955	442-1012	356-1097	371-998	556-1112	413-1724	342-1254	584-***1753***	399-1397
	Average	755	925	870	706	710	746	696	793	813	549	907	832
Waikiki	Range	485-***2166***	684-2009	684-1724	342-1411	684-1226	399-1496	257-1040	542-1466	627-2038	670-1425	14-1995	86-1568
	Average	963	1193	1175	679	907	1065	603	790	1003	978	718	788
Kapolei	Range	95-613	100-556	100-584	29-485	0-***1055***	0-584	114-741	257-584	71-827	86-556	14-684	114-812
	Average	285	287	283	219	353	216	490	404	345	327	320	495
West Beach	Range	71-314	128-371	114-456	100-342	114-385	100-413	49-342	114-342	0-244	14-499	0-***1012***	14-399
	Average	133	230	267	181	274	235	164	146	103	2128	228	189

Table 4-12 **Monthly Summary of 1-Hour Ozone (µg/m^3)**

Station		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Sand Island	Range	0-86	0-88	0-90	2-***98***	2-76	2-47	2-51	0-53	0-39	0-55	0-69	0-80
	Average	47	32	45	55	32	20	21	22	15	27	33	30

Table 4-13 **Monthly Summary of 3-Hour Sulfur Dioxide (µg/m^3)**

Station		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Honolulu	Range	0-***65***	0-17	3-18	0-3	0-2	0-3	0-2	0-17	0-6	0-7	0-7	0-5
	Average	1	4	3	<1	<1	<1	<1	<1	1	3	<1	1
Makaiwa	Range	0-27	0-48	0-55	0-12	0-61	0-46	0-8	0-18	0-49	0-61	0-25	2-***72***
	Average	2	5	3	2	4	3	2	3	4	3	3	6
Kapolei	Range	0-18	0-14	0-5	0-3	0-16	0-14	0-14	0-9	0-3	0-10	0-3	0-***23***
	Average	3	1	1	<1	1	1	1	<1	<1	<1	<1	2
West Beach	Range	0-***11***	0-3	0-5	0-4	0-4	0-5	0-5	3-5	3-4	0-1	0-0	0-8
	Average	1	<1	1	1	2	3	3	3	3	<1	0	<1
Kona	Range	3-37	2-49	3-***50***	3-44	0-23	5-13	5-10	5-16	0-22	0-41	0-28	0-38
	Average	7	7	7	8	7	6	6	7	5	4	4	6
Hilo	Range	0-136	0-***438***	0-106	0-187	0-5	0-20	0-3	0-3	0-115	0-2	0-16	0-174
	Average	4	19	6	4	2	1	1	<1	1	<1	2	11
Honokaa	Range	0-98	1-***213***	1-49	2-3	0-3	3-45	0-3	Station discontinued on 8/01/00				
	Average	4	9	4	3	2	3	3					

Table 4-14 **Monthly Summary of 24-Hour Sulfur Dioxide (µg/m^3)**

Station		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Honolulu	Range	0-***9***	<1-7	3-6	0-3	0-<1	0-<1	0-<1	0-2	0-3	1-3	0-3	0-3
	Average	1	4	3	<1	<1	<1	<1	<1	1	3	<1	1
Makaiwa	Range	<1-12	2-16	1-13	<1-5	<1-11	<1-17	1-4	0-6	<1-10	1-11	1-7	3-***20***
	Average	2	5	3	2	4	3	2	3	4	3	3	6
Kapolei	Range	2-5	0-5	0-3	0-1	0-5	0-5	0-4	0-3	0-1	0-2	0-1	<1-***6***
	Average	3	1	1	<1	1	1	1	<1	<1	<1	<1	2
West Beach	Range	<1-***4***	<1-1	<1-3	1-2	1-3	1-4	1-4	3-4	3-3	0-<1	0-0	0-2
	Average	1	<1	1	1	2	3	3	3	3	<1	0	<1
Kona	Range	4-16	2-14	3-***25***	3-15	4-11	5-9	5-7	5-9	0-10	<1-12	0-10	2-16
	Average	7	7	7	8	7	6	6	7	5	4	4	6
Hilo	Range	0-41	1-***94***	<1-34	2-28	<1-3	<1-5	<1-3	0-1	0-26	<1-1	1-5	1-73
	Average	4	19	6	4	2	1	1	<1	1	<1	2	11
Honokaa	Range	1-25	2-***61***	2-15	2-3	1-3	3-12	2-3	Station discontinued on 8/01/00				
	Average	4	9	4	3	2	3	3					

Table 4-15 **Monthly Summary of 24-Hour Nitrogen Dioxide (µg/m^3) [a]**

Station		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Kapolei	Range	3-14	1-19	5-19	2-11	5-11	4-12	5-11	6-17	6-15	7-14	4-14	7-***21***
	Average	7	11	10	7	7	7	8	11	9	11	8	12
West Beach	Range	1-14	2-***18***	2-12	1-11	3-11	2-10	3-6	3-12	3-10	0-11	4-12	5-16
	Average	5	9	5	4	6	5	5	5	6	4	7	10

[a] There is no 24-hour state or federal standard for nitrogen dioxide

Table 4-16 **Monthly Summary of 1-Hour Hydrogen Sulfide (µg/m^3)**

Station		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Lava Tree	Range	3-***7***	0-4	0-4	0-4	0-4	0-3	0-1	0-1	1-1	1-3	1-7	0-3
	Average	3	3	3	2	1	1	1	1	1	1	1	1
Puna E	Range	0-1	0-1	0-3	0-3	0-1	0-7	0-1	0-1	0-1	0-0	0-***13***	0-0
	Average	<1	<1	<1	<1	1	1	<1	<1	<1	0	<1	0

Section 5
AMBIENT AIR QUALITY TRENDS

The following graphs illustrate 5-year trends for PM_{10}, ozone, carbon monoxide, sulfur dioxide, and nitrogen dioxide from 1996 to 2000.

The graphs for PM_{10}, sulfur dioxide and nitrogen dioxide (figures 5-1, 5-2, 5-5 and 5-6, respectively) represent the annual averages for each year and for each station that monitors for that pollutant. Annual averages are derived by calculating the arithmetic mean of all valid hours recorded in the year. Included in the graphs are the state and federal annual standard(s).

The graphs for 1-hour ozone and 1-hour carbon monoxide (figures 5-3 and 5-4, respectively) represent the average of the daily maximum 1-hour values recorded in the year. These values are obtained by taking the highest recorded 1-hour value for each day then calculating the arithmetic mean of all those hours to arrive at the annual maximum average. Ozone and carbon monoxide do not have state or federal annual standards, however, included in the graphs are the 1-hour standards.

Figure 5-1 **Island of Oahu: PM_{10} Annual Average 1996 - 2000**

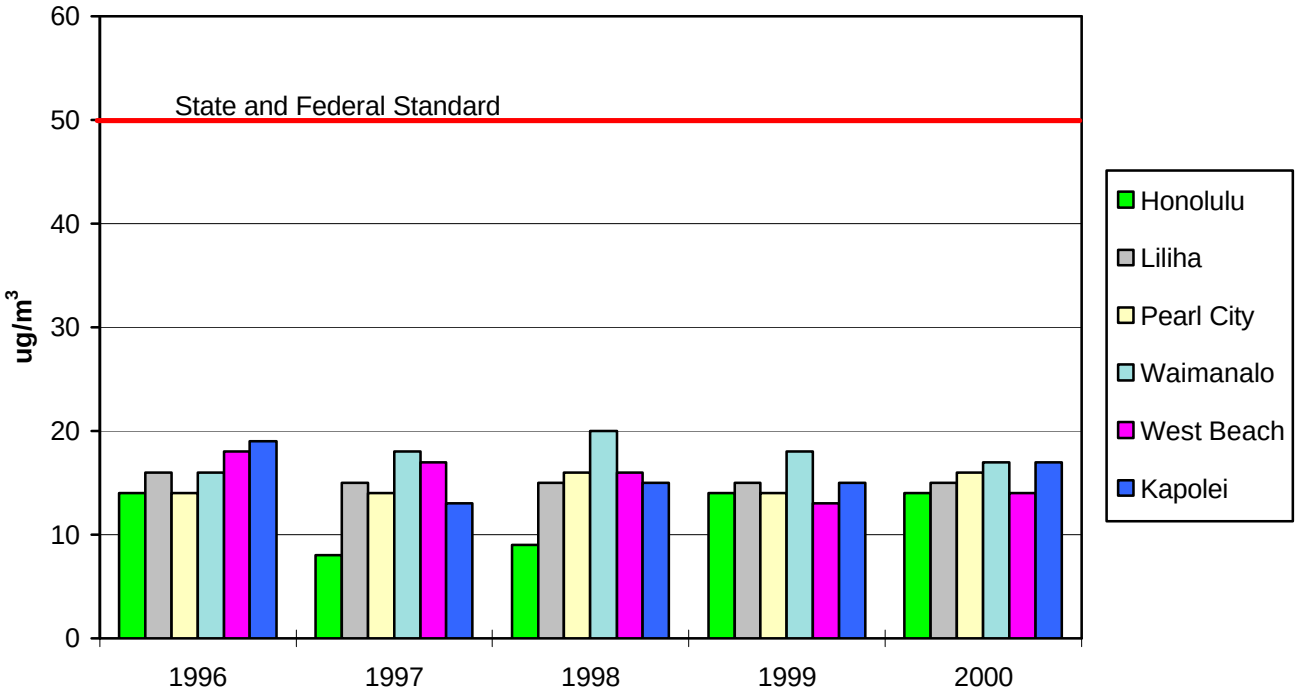


Figure 5-2 **Island of Kauai: PM_{10} Annual Average 1996 - 2000**

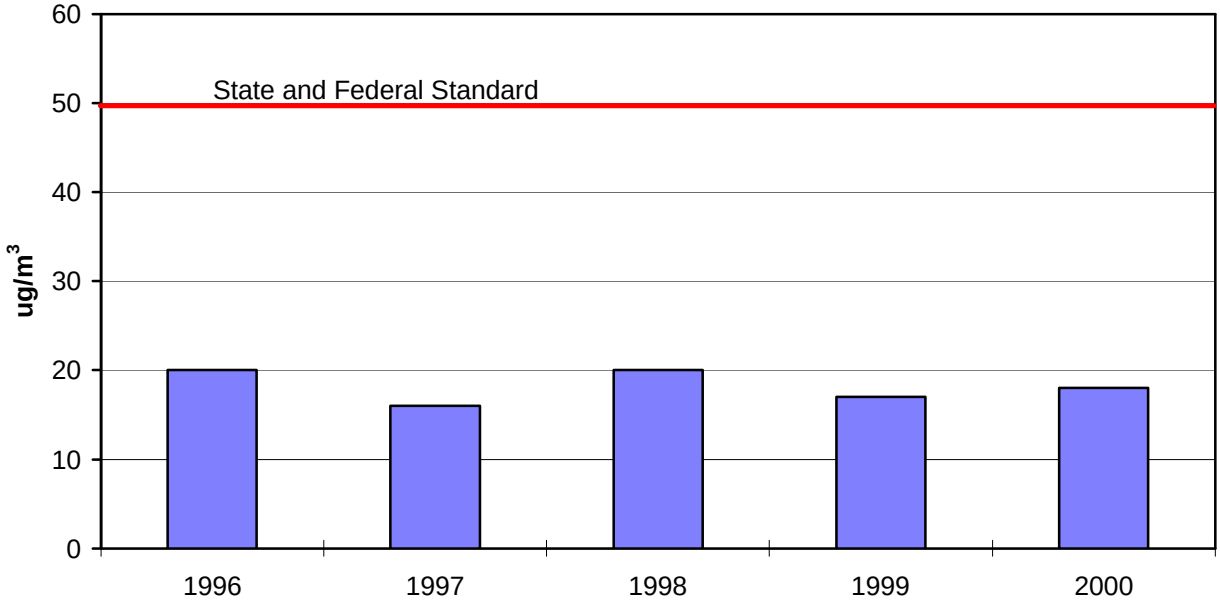


Figure 5-3 **Annual Average of Daily Maximum 1-Hour Ozone 1996 - 2000**

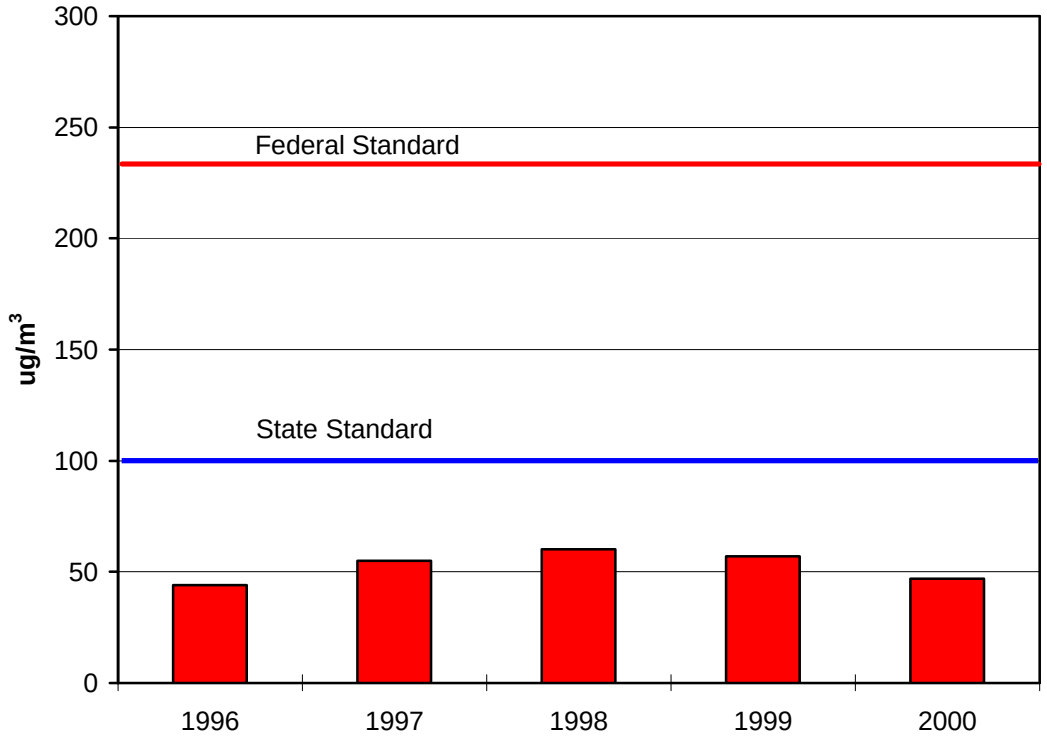


Figure 5-4 **Annual Average of Daily Maximum 1-Hour Carbon Monoxide 1996 - 2000**

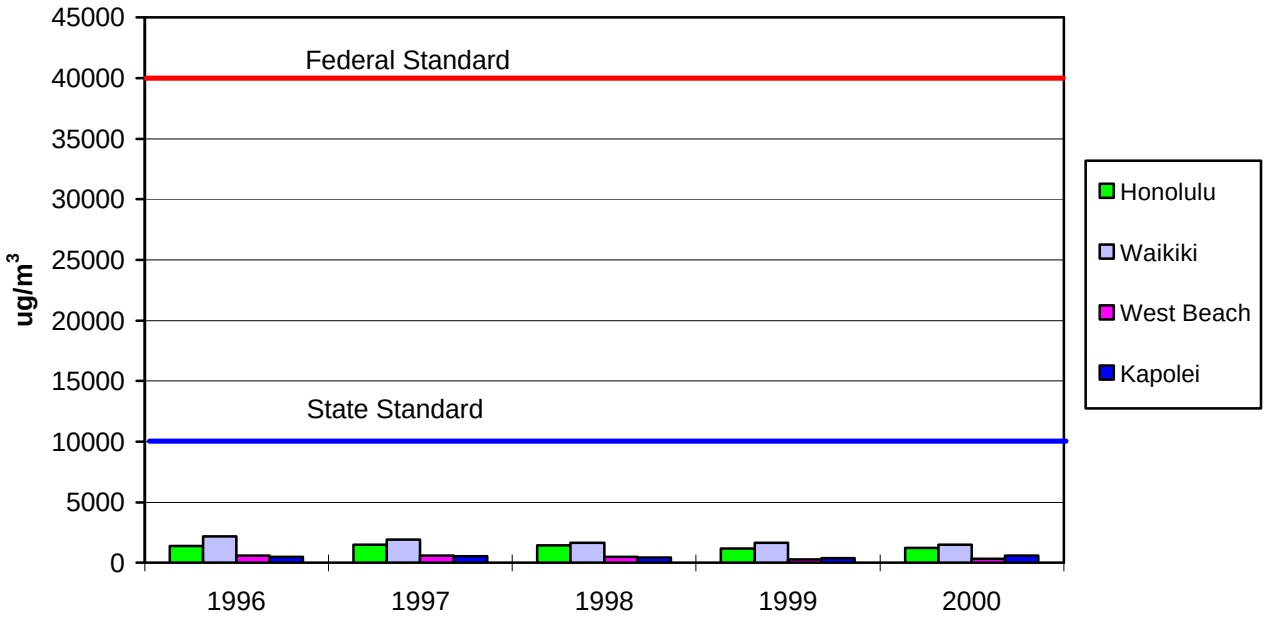


Figure 5-5 **Annual Average Sulfur Dioxide**
1996 - 2000

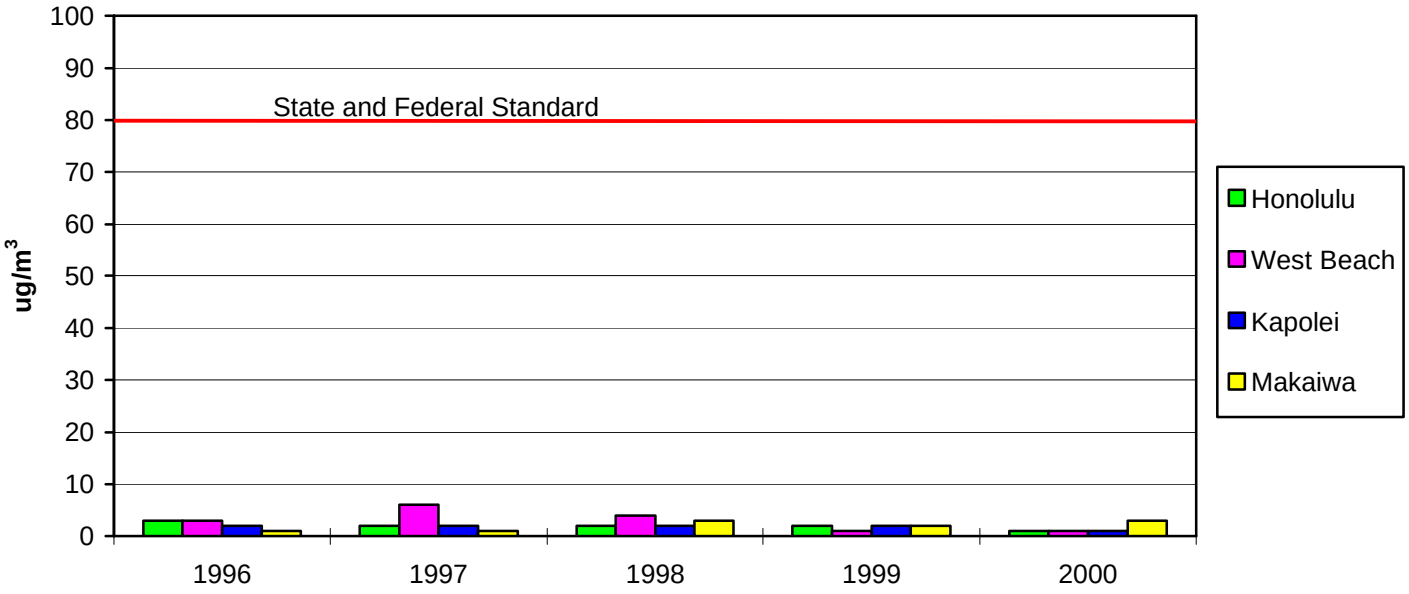


Figure 5-6 **Annual Average Nitrogen Dioxide**
1996 - 2000